



晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AM-1024768ETMCW-00
APPROVED BY	
DATE	

☐ Approved For Specifications

☐ Approved For Specifications & Sample

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**RECORD OF REVISION**

Revision Date	Page	Contents	Editor
2009/8/3	--	New Release	Edward

1. Features

AM-1024768E is a color active matrix TFT LCD module using AFFS(Advanced Fringe Field Switching: Wide viewing technology) mode and amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 12.1 inch diagonally measured active area with XGA resolutions (1024 horizontal by 768 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 262,144 colors. The TFT-LCD panel used for this module is a low reflection and higher color type.

- (1) LVDS Interface with 1pixel / clock
- (2) High-speed response
- (3) 6-bit color depth, Display 262,144 colors
- (4) Incorporated edge type back-light (1 lamp)
- (5) High luminance and contrast ratio, Glare and wide viewing angle
- (6) DE (Data Enable) mode only
- (7) RoHS compliant.

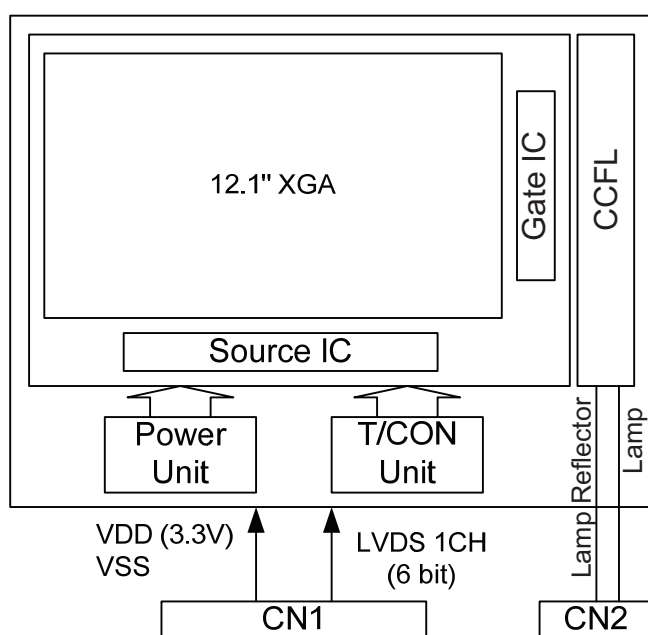
2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit	Note
Active area	245.76 (H) × 184.32 (V)	mm	
Number of pixels	1024(H) × 768(V)	pixels	
Pixel pitch	0.240(H) × 0.240(V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	262,144	colors	
Display mode	Normally Black		
Dimensional outline	270.0 (H) × 199.0 (V) × 4.8 @Lamp	mm	(2)
Weight	305 (Typ.)	gram	
Back-light	Bottom edge side 1-CCFL type		(1)
Surface treatment	Haze 25, Anti-glare & hard-coating (3H)		

Note : 1. CCFL (Cold Cathode Fluorescent Lamp)

2. LCM Height: 4.8[mm]Typ.(Lamp) , 6.7[mm] Typ(Pouch)

2-1 Block Diagram



3. ABSOLUTE MAX. RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.

[VSS = GND = 0V]

Item	Symbol	Values		UNIT	Note
		Min.	Max.		
Power Input Voltage	VDD	VSS-0.3	4.0	V	Ta = 25 ±2 °C
Logic Input Voltage	VIN	VSS-0.3	VDD+0.3	V	
Back-light Lamp Current	IBL	2.0	6.0	mA	
Back-light Lamp Frequency	FL	30	80	KHz	
Operating Temperature (Humidity)	TOP RH	0	+50 80	°C %	≤40°C
Storage Temperature (Humidity)	TSP RH	-20	+60 90	°C %	≤40°C

4. ELECTRICAL CHARACTERISTICS

4-1 Typical Operation Conditions

Item	Symbol	Values			Unit	Note
		MIN	TYP	MAX		
Power Supply Voltage	VDD	3.0	3.3	3.6	V	
Power Supply Current	IDD	--	240	--	mA	(1)
Permissible Input Ripple Voltage	VRF	--	--	100	mV	VDD=3.3V
High Level Differential Input Threshold Voltage	VIH	--	--	+100	mV	VCM=1.2V typ.
Low Level Differential Input Threshold Voltage	VIL	-100	--	--	mV	
Back-light Lamp Voltage	VBL	--	600	--	Vrms	
Back-light Lamp Current	IBL	2.0	5.0	6.0	mA _{rm}	
Back-light Lamp Frequency	FL	30	60	80	KHz	(2)
Lamp Start Voltage		--	--	950	Vrms	Ta=25°C, (3)
		--	--	1150	Vrms	Ta=0°C, (3)
Lamp Life		10K	--	--	Hrs	IBL= 2.0~6.0mA
Power Consumption	PD	--	0.7	--	W	
	PBL	--	3.0	--	W	IBL=5.0mA , (4)
	Ptotal	--	3.7	--	W	

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.

The current draw and power consumption specified is for VDD=3.3V,
Frame rate = 60Hz and Clock frequency=65MHz.

Test Pattern of power supply current.

a) Typ: Vertical color bar pattern b) Max: Gray 28 @ Vertical 2 Skip line pattern

2. The lamp frequency should be selected as different as possible from the horizontal synchronous frequency and its harmonics to avoid interference, which may cause line flow on the display

3. The voltage above this value should be applied to the lamps for more than 1 second to startup. Otherwise the lamps may not to be turned on.

4. Calculated value for reference (VBL × IBL) excluding inverter loss.

5. Optical Specifications

The measurement shall be executed after 30 minutes warm-up period.

Measuring equipment: TOPCON-BM5.

[VDD=3.3V, Frame rate=60Hz, Clock=65MHz, IBL = 5.0mA, Ta = 25±2℃]

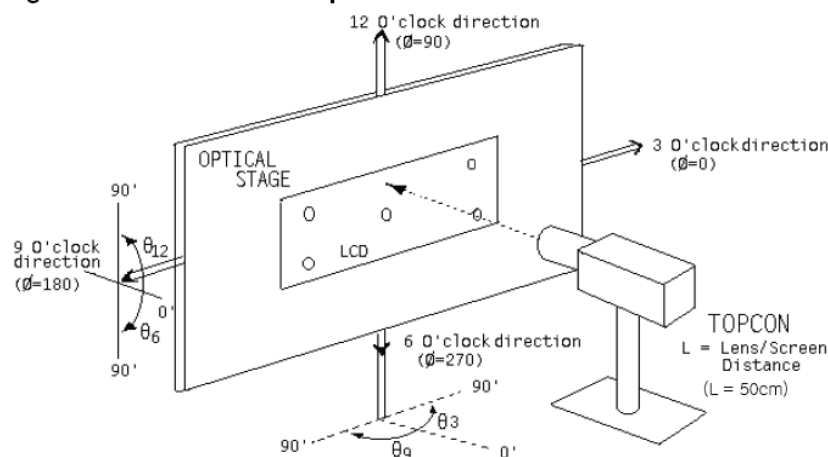
Item		Symbol	Condition	Values			Unit	Note
				Min.	Typ.	Max.		
Viewing Angle Range	Horizontal	Θ3	CR > 10		89	90	Deg.	(1)
		Θ 9			89	90		
	Vertical	Θ12			89	90		
		Θ6			89	90		
Luminance Contrast ratio		CR	Θ = 0° (Center) Normal Viewing Angle	--	450	--		(2)
Luminance of white		YL		--	180	--	cd/m2	(3)
White luminance uniformity		ΔY		--	--	1.4		(4)
Color Cord.	White	Xw		0.282	0.312	0.342		(5)
		Yw		0.307	0.337	0.367		
	Red	XR		0.547	0.577	0.607		
		YR		0.314	0.344	0.374		
	Green	XG		0.281	0.311	0.341		
		YG		0.511	0.541	0.571		
	Blue	XB		0.120	0.150	0.180		
		YB		0.114	0.144	0.174		
Color Reproduction					40		%	
Response Time	Ttotal (Tr+Td)	Ttotal			40		ms	(6)
Cross Talk		CT			--	--	2.0	%

(Table 4.)

Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface

Figure 1. Measurement Set Up

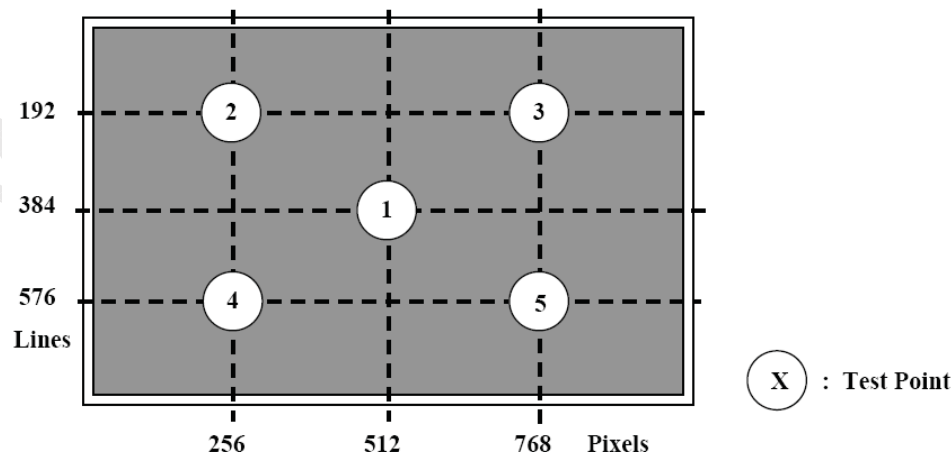


2. Contrast measurements shall be made at viewing angle of $\Theta = 0^\circ$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

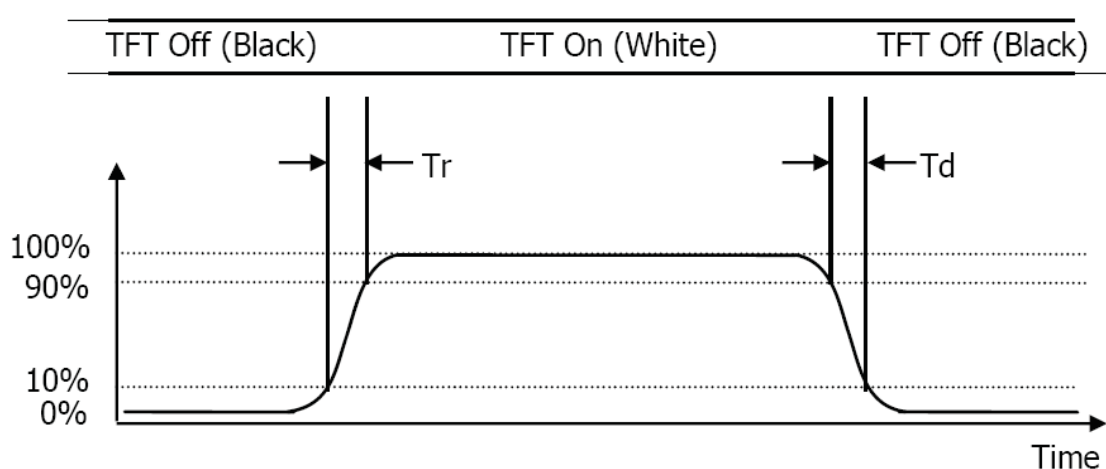
3. Luminance of white is defined as a center point(#1) on LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

Figure 2. Average Luminance Measurement Locations & Uniformity Measurement Locations



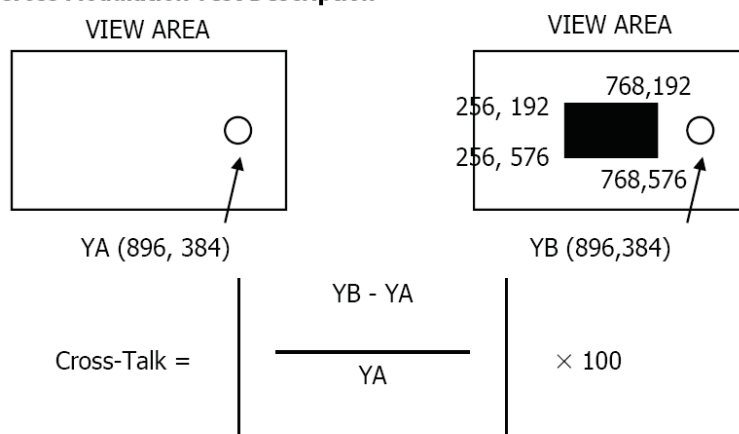
4. The White luminance uniformity on LCD surface is then expressed as : $\Delta Y = \text{Minimum Luminance of 5 points} / \text{Maximum Luminance of 5 points}$ (see FIGURE 2 shown in Appendix).
5. The color chromaticity coordinates specified in Table 4 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.
6. The electro-optical response time measurements shall be made as FIGURE 3 shown in Appendix by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is T_r , and 90% to 10% is T_d .

Figure 3. Response Time Testing



7. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (Y_A) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (Y_B) of that same area when any adjacent area is driven dark. (See FIGURE 4 shown in Appendix).

Figure 4. Cross Modulation Test Description



Where:

Y_A = Initial luminance of measured area (cd/m^2)

Y_B = Subsequent luminance of measured area (cd/m^2)

The location measured will be exactly the same in both patterns.

6. INTERFACE

6.1 Electrical Interface Connection

CN1 : Interface Connector : Hirose/DF19L-20P-1H or equivalent

User side Connector : Hirose/DF19G-20S-1C or equivalent

Pin No.	Symbol	Description	Note
1	VDD1	Power Supply: +3.3V	
2	VDD2	Power Supply: +3.3V	
3	VSS	Ground	
4	VSS	Ground	
5	RIN0-	LVDS Negative data signal (-)	Tx pin # 48
6	RIN0+	LVDS Positive data signal (+)	Tx pin # 47
7	VSS	Ground	
8	RIN1-	LVDS Negative data signal (-)	Tx pin # 46
9	RIN1+	LVDS Positive data signal (+)	Tx pin # 45
10	VSS	Ground	
11	RIN2-	LVDS Negative data signal (-)	Tx pin # 42
12	RIN2+	LVDS Positive data signal (+)	Tx pin # 41
13	VSS	Ground	
14	RCLKIN-	LVDS Negative clock signal (-)	Tx pin # 40
15	RCLKIN+	LVDS Positive clock signal (+)	Tx pin # 39
16	VSS	Ground	
17	NC	No Connection	
18	NC	No Connection	
19	VSS	Ground	
20	VSS	Ground	

6.2 Back-light interface

CN1 : Interface Connector : JST/BHSR-02VS-1 or equivalent

User side Connector : JST/MS02B-BHSS-1 or equivalent

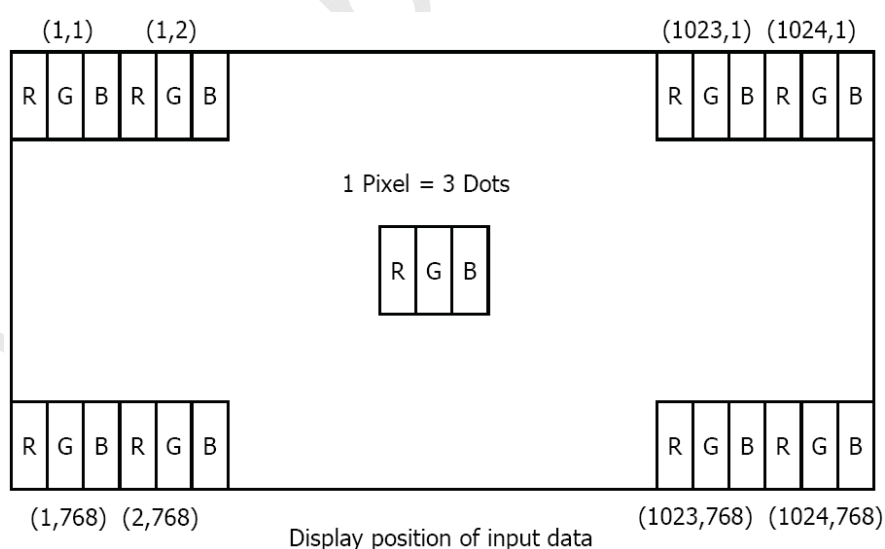
Pin No.	Input	Description	Note
1	HOT	High voltage	
2	COLD	Ground	

6.3 LVDS Interface

LVDS Transmitter : THC63LVDM83A or equivalent.

Input Signal	Transmitter		Interface		DF19L-14P-1H	Note
	Pin No.	Pin No.	System(TX)	TFT-LCD(RX)	Pin No.	
R0	51	48 47	OUT0- OUT0+	IN0- IN0+	5 6	
R1	52					
R2	54					
R3	55					
R4	56					
R5	3					
G0	4	46 45	OUT1- OUT1+	IN1- IN1+	7 8	
G1	6					
G2	7					
G3	11					
G4	12					
G5	14					
B0	15	42 41	OUT2- OUT2+	IN2- IN2+	9 10	
B1	19					
B2	20					
B3	22					
B4	23					
B5	24					
HSYNC	27					
VSYNC	28					
DE	30					
MCLK	31	40 39	CLKOUT- CLKOUT+	CLKIN- CLKIN+	11 12	

6.4 Data Input Format



7. Signal Timing Specifications

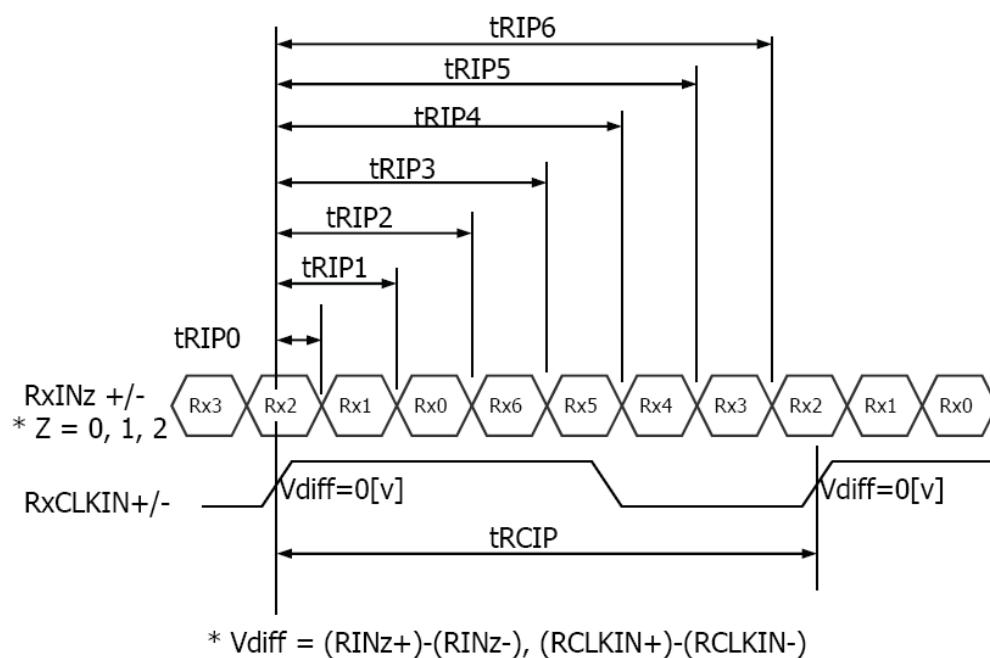
7-1 The 12.1"XGA LCM is operated by the only DE (Data enable) mode (LVDS Transmitter Input)

Item		Symbols	Min	Typ	Max	Unit
Clock	Frequency	1/Tc	-	65	80	MHz
	High Time	Tch	4.5	-	-	ns
	Low Time	Tcl	4.5	-	-	ns
Data	Setup Time	Tds	2.7	-	-	ns
	Hold Time	Tdh	0	-	-	ns
Data Enable Setup Time		Tes	2.7	-	-	ns
Frame Period		Tv	772	806	1022	lines
Vertical Display Period		Tvd	768	768	768	lines
One Line Scanning Period		Th	1100	1344	2046	clocks
Horizontal Display Period		Thd	1024	1024	1024	clocks

7-2 LVDS Rx Interface Timing Parameter

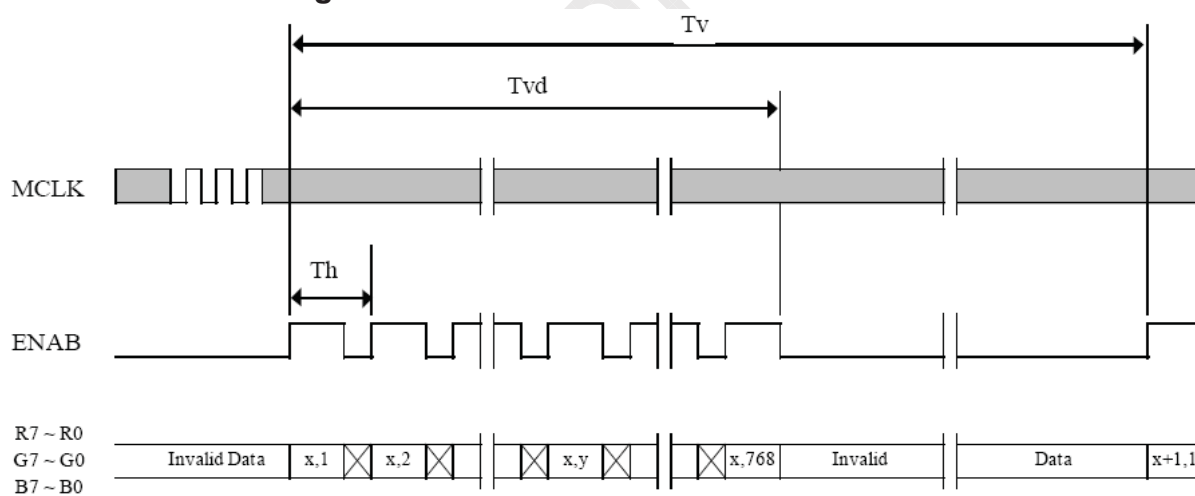
The specification of the LVDS Rx interface timing parameter
<LVDS Rx Interface Timing Specification>

Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	12.5	15.38		nsec	
Input Data 0	tRIP0	-0.4	0.0	+0.4	nsec	
Input Data 1	tRIP1	tRICP/7-0.4	tRICP/7	tRICP/7+0.4	nsec	
Input Data 2	tRIP2	2 × tRICP/7-0.4	2 × tRICP/7	2 × tRICP/7+0.4	nsec	
Input Data 3	tRIP3	3 × tRICP/7-0.4	3 × tRICP/7	3 × tRICP/7+0.4	nsec	
Input Data 4	tRIP4	4 × tRICP/7-0.4	4 × tRICP/7	4 × tRICP/7+0.4	nsec	
Input Data 5	tRIP5	5 × tRICP/7-0.4	5 × tRICP/7	5 × tRICP/7+0.4	nsec	
Input Data 6	tRIP6	6 × tRICP/7-0.4	6 × tRICP/7	6 × tRICP/7+0.4	nsec	

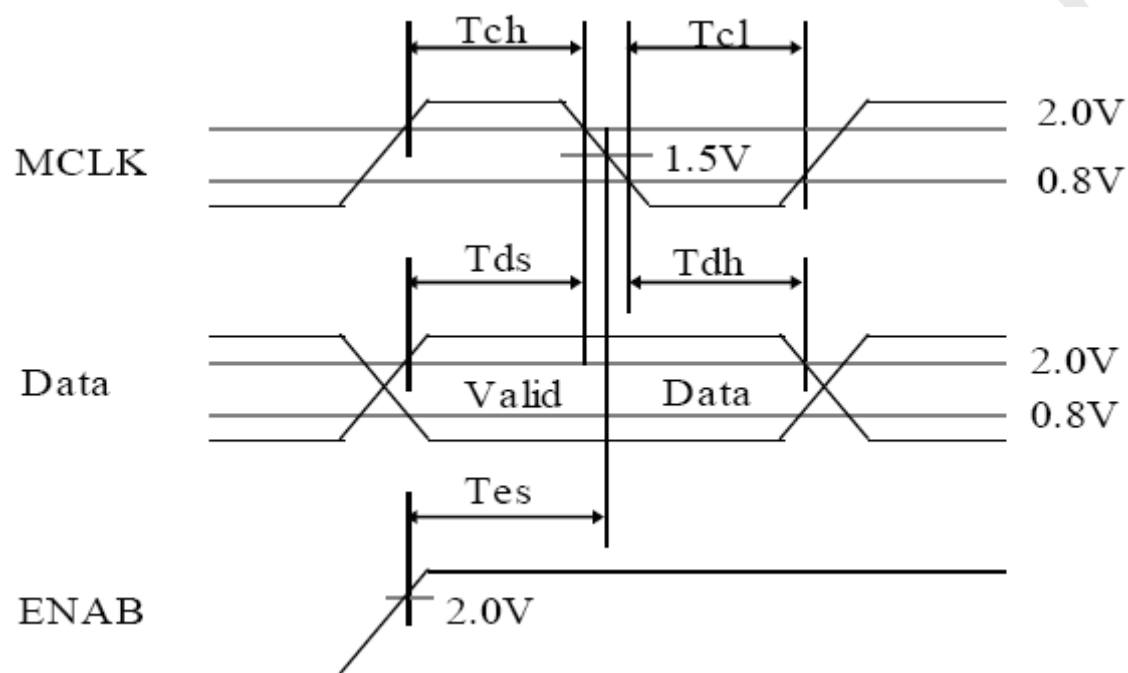
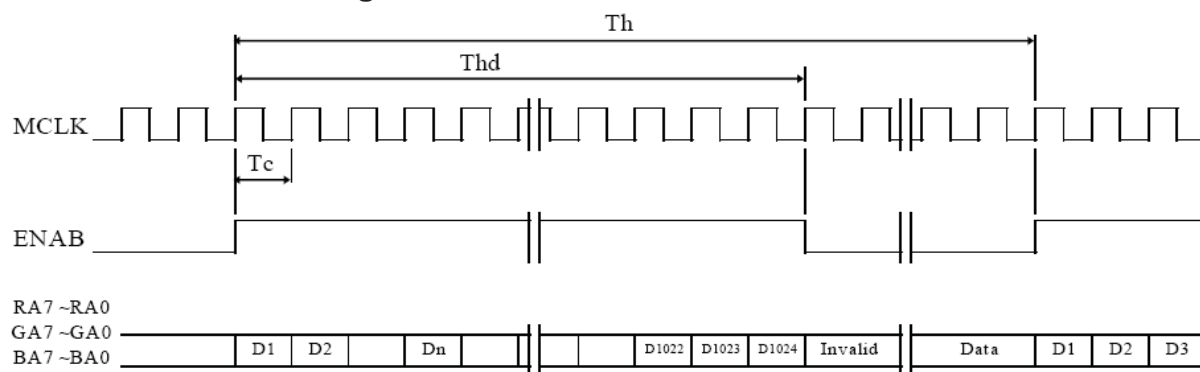


8. Signal Timing Waveforms Of Interface Signal (DE Mode)

8.1 Vertical Timing Waveforms



8.1 Horizontal Timing Waveforms



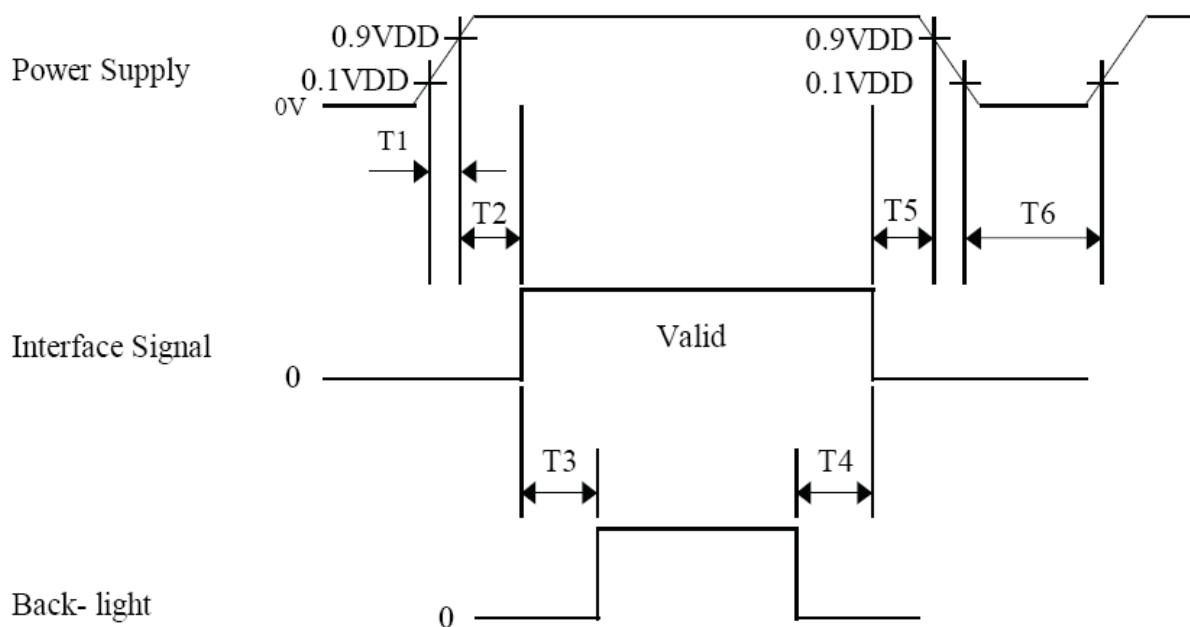


9. Input Signals, Basic Display Coors & Gray Scale of Colors

Colors & Gray Scale		Red Data						Green Data						Blue Data					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	↓						↓						↓					
	▽	↓						↓						↓					
	Brighter	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	▽	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	△	↓						↓						↓					
	▽	↓						↓						↓					
	Brighter	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	▽	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale Of Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	△	↓						↓						↓					
	▽	↓						↓						↓					
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	▽	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
Gray Scale Of White & Black	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1
	Darker	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0
	△	↓						↓						↓					
	▽	↓						↓						↓					
	Brighter	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1
	▽	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

10. Power Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below



- $0 < T1 \leq 10 \text{ ms}$
- $0 < T2 \leq 50 \text{ ms}$
- $100 \text{ ms} \leq T3, T4$
- $0 < T5 \leq 50 \text{ ms}$
- $1 \text{ sec} < T6$

Notes :

1. When the power supply VDD is 0V, Keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on.
3. Back Light must be turn on after power for logic and interface signal are valid.



11. RELIABILITY TEST CONDITIONS

Item	Test Conditions	Note
High temperature storage test	Ta = 60 °C, 240 hrs	
Low temperature storage test	Ta = -20 °C, 240 hrs	
High temperature & high humidity operation test	Ta = 50 °C, 80%RH, 240hrs	
High temperature operation test	Ta = 50 °C, 240 hrs	
Low temperature operation test	Ta = 0 °C, 240 hrs	
Thermal shock	Ta = -20 °C ~ 60 °C (0.5H), 100 cycle	
Vibration test (non-operating)	Frequency : 10~500Hz Gravity/AMP : 1.5G Period : X,Y,Z 30min	
Shock test (non-operating)	Gravity : 150G Pulse width : 6ms, half sine wave ±X, ±Y, ±Z Once for each direction	
Electro-Static Discharge Test (non-operating)	Air : 150pF 330ohm 15KV Contact : 150pF, 330ohm, 8KV	

12. HANDLING & CAUTIONS

12.1 Cautions when taking out the module

Pick the pouch only, when taking out module from a shipping package.

12.2 Cautions for handling the module

12.2.1 As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.

12.2.2 As the LCD panel and backlight element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.

12.2.3 As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.

12.2.4 Do not pull the interface connector in or out while the LCD module is operating.

12.2.5 Put the module display side down on a flat horizontal plane.

12.2.6 Handle connectors and cables with care.

12.3 Cautions for the operation

12.3.1 When the module is operating, do not lose MCLK, DE signals. If any one of these signals were lost, the LCD panel would be damaged.

12.3.2 Obey the supply voltage sequence. If wrong sequence were applied, the module would be damaged.

12.4 Cautions for the atmosphere

12.4.1 Dewdrop atmosphere should be avoided.

12.4.2 Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer-packing pouch and under relatively low temperature atmosphere is recommended.

12.5 Cautions for the module characteristics

12.5.1 Do not apply fixed pattern data signal to the LCD module at product aging.

12.5.2 Applying fixed pattern for a long time may cause image sticking.

12.6 Other cautions

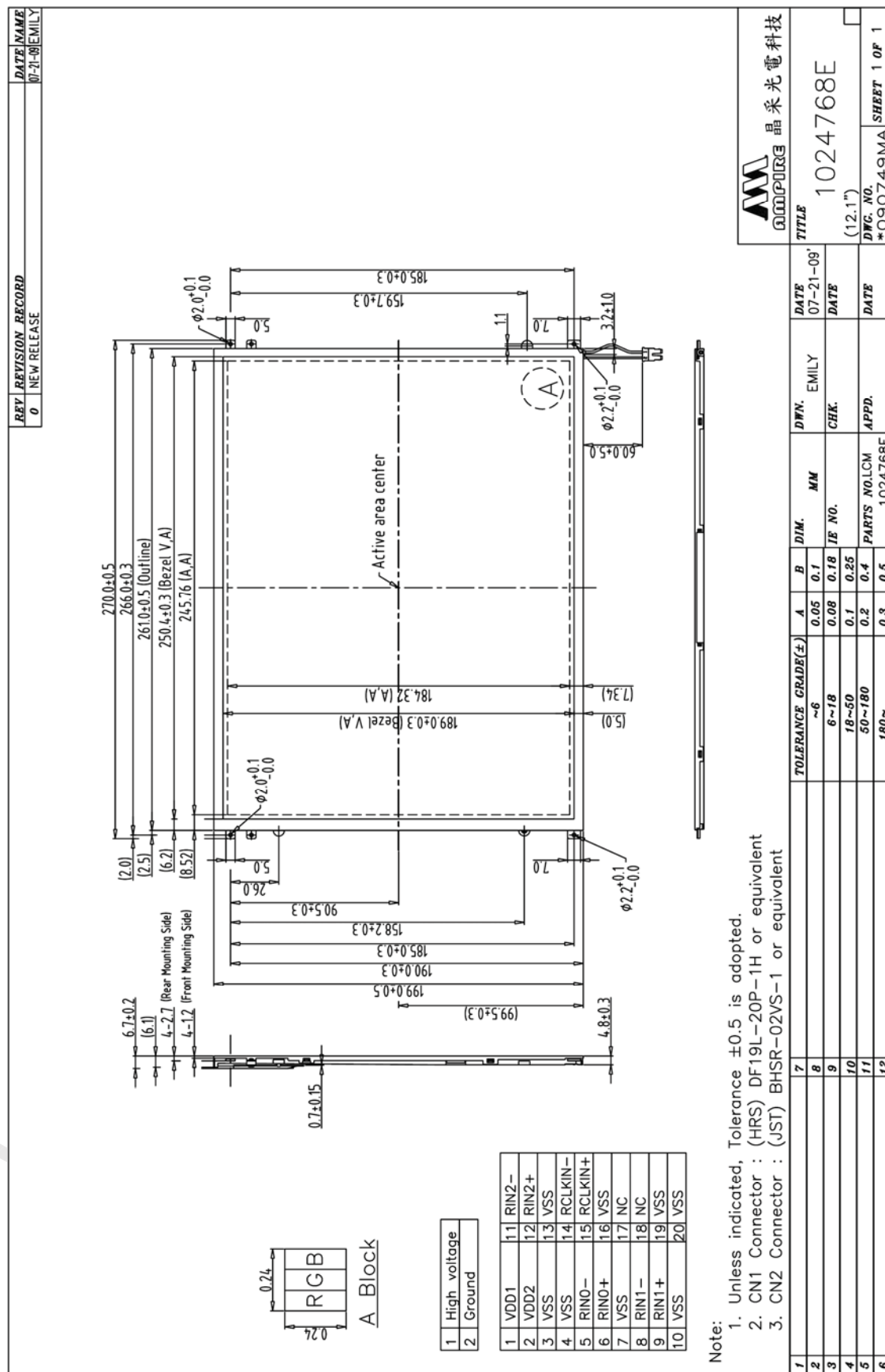
12.6.1 Do not disassemble and/or re-assemble LCD module.

12.6.2 Do not re-adjust variable resistor or switch etc.

12.6.3 When returning the module for repair or etc, please pack the module not to be broken. We recommend using the original shipping packages.

12.6.4 AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

13. OUTLINE DIMENSION



Date : 2009/08/03

AMPIRE CO., LTD.

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